

DIPTERIDIA

ITS NATURE

CAUSES, PREVENTION

AND CURE

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DIPHTHERIA:

—ITS—

CAUSES, PREVENTION,

—AND—

PROPER TREATMENT.

BY

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By J. H. KELLOGG, M. D.,

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P R E F A C E.

THE great prevalence and fearful fatality of diphtheria during the last few years has created a popular demand for information regarding it. In answer to this desire for knowledge, numerous fragmentary articles have appeared in the newspapers on the subject, some of which have been of a useful character, while the majority have been more sensational than practical. The object of this work—whether attained or not the reader must judge—has been to supply this demand more fully than it has been met heretofore.

The more intelligent and observing members of the medical profession everywhere, now generally recognize the fact that the greatest need of the times is popular medical literature. The common people need to be taught how to take care of themselves when sick as well as when in health. Preventive medicine is of much greater importance than curative medicine, since it directly concerns a much larger number of individuals, and if applied successfully, obviates, in large measure, the necessity for medical treatment. In order to make measures preventive of disease of really practical value, the people must be educated on the subject of disease, its nature and causes, and must become acquainted with the rationale of curative measures, which should in all cases be based, primarily, on the removal of causes.

This monograph is not intended to supersede the necessity for a physician in the treatment of the disease considered, but rather to render those who may peruse its pages so intelligent on the subject that they may be able to so efficient-

ly second the efforts of a wise physician as to greatly increase the chances of a favorable issue.

It is desired that parents and all who have the care of children, who are especially subject to this disease, should become sufficiently acquainted with its nature, causes, and most prominent phenomena, to be able to discover the disease at its first appearance; to appreciate the importance of employing energetic measures for the destruction of the contagious element of the disease, and the prevention of the extension of the infection; and in cases of extreme urgency, and in the absence of more competent persons, to be prepared to make such applications of remedies as will accomplish something toward staying the ravages of this terrible malady.

In writing upon the treatment of diphtheria, the author has described the methods which he employs in his own practice, and which he has found successful in a large number of cases, some of which were of the worst form. These methods are not presented as original. They have been selected from those described in the numerous articles on the subject, written by those of the most extensive experience. The author is especially indebted to the very exhaustive treatise on the subject of diphtheria in "Ziemssen's Cyclopædia of Medicine."

J. H. K

BATTLE CREEK, MICH., {
December 25, 1878. }

DIPHTHERIA.

HISTORY OF THE DISEASE.

IT is interesting to trace in brief outline the history of a malady which has for many years been ravaging the homes of thousands in this and other countries, sometimes sweeping away whole families almost with the rapidity of the terrible plagues of the Middle Ages, often decimating the little ones of a whole community, and filling the land with a lamentation almost as pitiful as that described in Holy Writ as being heard in ancient Bethlehem when Rachel wept for her children slain by the cruel hand of Herod. We run no risk in the assertion that not more children perished in that heartless massacre than often, in our large cities, in a single week fall victims to the fell destroyer which we have made the subject of this little monograph.

An Ancient Malady.—The erroneous notion has been held by some that diphtheria (pronounced *dif-thē'-ri-a*) is distinctly a modern disease. That this is not

the case is clearly shown by reference to the works of ancient medical writers in which are found numerous very distinctive descriptions of this malady which was as fatal in ancient times as at the present day.

Homer and Hippocrates, who wrote several centuries before the Christian era, were each familiar with this disease under the name of *Malum Ægyptiacum*. As the ancient name indicates, the disease was by early writers supposed to originate in Egypt and Syria.

An epidemic of diphtheria occurred in Rome A. D. 380. Holland was visited by the disease in 1557. Many other parts of Europe suffered from its ravages in the two last centuries. The first recorded occurrence of this affection on the American continent was in 1771, described by Samuel Bard in 1786. In 1856 another very severe epidemic visited this country, since which time it has been very common, seemingly increasing in virulence from year to year, sometimes abating its ravages for a single season, then breaking out with redoubled fury and fatality the next.

Investigation of the Disease.—Up to the year 1821, little was known of the real nature of the disease, notwithstanding the long acquaintance of physicians with its phenomena. At that time it was thoroughly investigated by Brettonneau, and to the facts elicited by his careful study of the history, nature, and causes of the disease, the profession have been constantly adding new facts of practical interest in its prevention and treatment.

The microscope has been an invaluable aid in this

investigation. Indeed, without it, the real nature of the disease and its causes could never have been discovered. Through the aid of this marvelously useful little instrument we have now learned nearly the whole story of the disease, and the physician, if acquainted with what is known on the subject, may feel himself completely a master of its causes, its history, its results, and its proper treatment, although he may possibly be unable to so completely command the necessary conditions as in all cases successfully to control its manifestations. Nevertheless, it is to be hoped that the constant improvements made in the adaptation of remedies to the diseased conditions present in this malady, may ere long secure a far greater degree of success than is at present seen in the practice of the average practitioner. The author of this little work humbly hopes that it may in some degree contribute to the attainment of this desirable result.

NATURE OF THE DISEASE.

THE characteristic feature of the disease is a peculiar membranous formation which makes its appearance usually upon the fauces or tonsils, and is called *diphtheritic membrane*, from its resemblance to skin, which is the signification of the Greek word from which the name is derived.

A Diphtheritic Membrane.—This membrane, or rather false membrane, when first formed, is of a

grayish-white color; very tough, of leathery consistency, and adheres to the mucous membrane beneath it with great tenacity, it being very difficult to tear away except in shreds, and then only by laceration of the mucous membrane, leaving a bleeding surface. The false membrane, in fact, is not formed upon the mucous membrane or other tissue where it may occur, but in it. At least it sends down numerous rootlets which are imbedded between the cells of the tissue beneath.

Where the Membrane Occurs.—The membrane is not confined to the fauces. It may occur on any portion of the structures of the mouth, the inside of the cheeks, the gums, the tongue, the edges of the lips, as well as on the tonsils, the uvula, the soft palate, and pharynx generally. It may also occur in the nasal cavity, either primarily or secondarily, extending upward from the fauces.

We recently treated a case in which the whole back portion of the mouth was covered with the diphtheritic membrane, which also extended throughout the nasal cavity, and even appeared at the edges of the nostrils. The exudation may also occur at any other parts of the body where there is a union between skin and mucous membrane. Even the stomach and intestines sometimes become the seat of a diphtheritic membrane.

Nature of the Membrane.—The exact nature of this membrane has been the subject of much experimental inquiry. Besides being subjected to a most careful microscopical inquiry by hundreds of skilled

microscopists in the Old World as well as the New, eager pathologists have submitted it to the test of physiological analysis by applying it in various ways to lower animals. The results of these inquiries have been the establishment of the following facts:—

1. *The active cause of the characteristic features of diphtheria are vegetable organisms.*

2. *The false membrane is formed by the growth of these vegetable parasites in and upon the infected mucous membrane, and the vital resistance of the tissues to the depredations of the organisms.*

Disease Germs.—The recent application of the microscope to medical inquiries has developed the important fact that many diseases are occasioned by malign attacks upon the vital domain by germs of various kinds. It is well known that typhoid fever, yellow fever, malarial fevers, and most other febrile diseases, are occasioned by the introduction of germs into the system; but it has not in many cases been the good fortune of physicians to discover the exact character of these microscopical enemies of human life. In the case of diphtheria, many most eminent physicians and scientists are satisfied that the mischievous germ has been discovered, after a long-continued and pains-taking search.

The germ causes of diphtheria are very minute organisms, being too small to be seen except by the aid of a very good microscope. They are so small that a row of them an inch long would contain from ten to twenty thousand. Singly, they are too insignificant

to deserve attention except as microscopical curiosities; but when massed together in the countless numbers in which they infest the mucous membrane in this disease, they acquire an importance which is often terribly great to the victim of their ravages. There are two varieties of these parasites, known, respectively, as *micrococcus* and *bacterium termo*; the names are certainly no more formidable than the creatures themselves, small though they are. The two organisms are always associated, and can be very easily studied, with the aid of a good microscope, by any one at all familiar with the use of the instrument, by examination of the false membrane, freshly taken from a patient.

The Mode of Attack.—We have just taken a small piece of diphtheritic membrane from the throat of a patient suffering with the disease, and, placing it under the microscope with a little mucus from the same source, the germs referred to are distinctly visible in great numbers, all actively swimming about, making the whole microscopic field alive with motion. Just so they existed in the throat of the patient a few moments ago, where they were vigorously at work, insinuating themselves into the mucous membrane, prying their way in between the cells, even getting into the interior of the cells themselves, depriving them of the power to perform their functions, clogging the blood-vessels, causing irritation of the membrane, congestion, inflammation, and, as a consequence, partly, perhaps, as a protection, the pouring

out of fibrous matter, which helps to form the false membrane, together with the parasitic organisms themselves, and the disabled and disintegrated cells which they have destroyed.

Several other kinds of minute organisms are also visible, but they are of the sort which are always present in mouths not well cleansed, finding access from the air, and growing readily and multiplying in the fertile soil afforded by food accumulations in the cavities of decaying teeth, between the teeth, and wherever they can find a lodgment. These are comparatively harmless, though not quite so, if they are not such dangerous enemies as the *micrococcus* and *bacterium termo*, the two cruel Herods which mercilessly slaughter thousands of innocents every year, even out-Heroding Herod in their relentless massacre. In addition, we happen to find in the specimen just now under examination abundance of pus corpuscles, which indicates that the patient is on the road to recovery, since nature is pouring out a stream of purulent matter to wash away the germs, defend the tissues from their ravages, and aid in the reparation of the injured membrane.

Infecting the System.—The whole body, outside and inside, is inclosed in a sheath of cells called epithelium, both the skin and the mucous membrane being provided with this protection. This living wall of cells forms a barrier against the entrance into the body of obnoxious elements. Were it not for this protection, we should fall an easy prey to the hordes

of unseen but active and voracious enemies which swarm the air we breathe, gambol in the water we drink, and thickly tenant all the food we eat. To most of these emissaries of death and destruction, the agents of decomposition and decay, the epithelial sheath is an impenetrable barrier; but the *micrococcus* and the *bacterium termo*, the diphtheria organisms or parasites, possess the power of working themselves through this wall of cells, insinuating their infinitesimal bodies between the cells, even getting into the interior of the living cells and destroying them, thus undermining and tearing down the living wall which protects the delicate tissues beneath. Thus the assaulting germs find an easy road to the lymph channels, and quickly infest the glands to which the lymphatic vessels lead. By this means, also, they soon find their way into the circulation, where they multiply with marvelous fecundity, and rapidly increase to prodigious numbers, attacking the very citadels of life, and, alas, too often taking by storm the strongholds of the vital domain, making an easy prey of the organism which but a few hours or days before was jubilant with superabundant vital energy.

An examination of the blood of a person suffering severely with diphtheritic infection shows it to be filled with the very same organisms found in the false membrane, and in the fluids of the mouth of a diphtheritic patient.

Animals Subject to the Ravages of Germs.—

It is well known that animals are subject to many of

the same diseases that affect the human family. Especially are they subject to diseases which have a germ origin. They are remarkably susceptible to infection by the diphtheria organisms, and rapidly succumb to their destructive influence when the germs have been introduced into their systems by inoculation or otherwise. Many of the facts known respecting this much-dreaded disease have been elicited by experiments upon lower animals. Hundreds of dogs, rabbits, and other animals have perished of diphtheritic poisoning artificially produced for the purpose of learning the whole truth about this enemy of the human race, and thus discovering ways and means for staying its ravages and rescuing its victims from impending destruction. Such experiments may seem cruel to some; but the poor brutes were not tortured nor sacrificed to satisfy an idle curiosity, nor to settle a point in speculative philosophy. They died martyrs—involuntary, it is true—to the cause of humanity, in the interests of philanthropic efforts for the alleviation of human suffering. Had they been human, their names would have been wreathed with laurels as noble heroes.

An Interesting Question.—A question which has given rise to much discussion, on account of its important bearing as one of practical importance in the treatment of this grave malady, is this:—

Is the primary disorder a local or a general disease?

There are advocates of both sides of this question,

but the scientific evidence is undoubtedly in favor of the view that the primary disorder is wholly a local disease. Those who hold this view maintain that the germs which cause this disease are received by some part of the system, usually the throat, where they find lodgment and rapidly develop, penetrating the mucous membrane and infecting the general system in the manner already described, the part most often selected for attack being the throat, not from any particular preference of the disease for this part, but because the fauces are more exposed to infection by the organisms which cause the disease, being received during respiration, than are other parts of the body.

Those who hold the contrary view, regard the diphtheritic membrane which appears in the pharynx and other parts as a local evidence of a general disease which is manifested by the fever, exhaustion of the vital energies, and other general symptoms incident to the disease.

The facts which seem to point distinctly to the local nature of the disease are chiefly these:—

1. The local symptoms appear without the general symptoms, or, at least, with the fever and other general symptoms so slight as to scarcely merit attention.

2. In all cases there is more or less disorder of the parts on which the membrane first makes its appearance, from the outset of the disease.

3. Examinations of the blood show that the contamination of the system arises from organisms of the same character as those found in the diphtheritic membrane.

4. The worst general symptoms follow the development of the local disease, and are usually severe in proportion to its severity, that is, in proportion to the extent of the false membrane formed.

5. All the symptoms and results of the disease appear in animals to which it is communicated by inoculating the skin or the mucous membrane with diphtheritic matter from a false membrane, which is also proportionate in severity to the local manifestation.

Experience at the bedside continually affords confirmatory evidence of the local character of this disease. It is a well-known fact that it is extremely liable to appear in a wound, where the surface is denuded of epithelial covering. This fact has led physicians to abandon the use of blisters as a remedy in this disease, since the exposed surface is almost certain to become the seat of an extensive diphtheritic membrane, and the formation of a deep slough in consequence. This being the case, if the disease were of a general character and should attack a person suffering with a flesh wound of any sort, the local manifestations would be almost certain to appear in the wound rather than in other parts which were protected by an intact epithelial covering. A case of this sort came under our observation about one year ago. The patient was a young man of seventeen. He enjoyed fair health, but had been a cripple for seven years, owing to necrosis of the femur of his left leg. After somewhat improving his condition by tonic treatment, we operated upon the diseased limb,

removing the lower third of the femur with the exception of the epiphesis. The wound was five or six inches long, and was deep and gaping. The morning following the operation we were greatly surprised and alarmed to find a distinct diphtheritic patch in the fauces, but *none appeared in the wound*, either at the first or subsequently, and the patient made a rapid and complete recovery.

This case alone, to our mind, is sufficient to establish the local character of the disease. Had there been a general infection before any local manifestation, it would have been quite certain to show itself in the wound, where the conditions were favorable, rather than in the throat, where there were no special predisposing conditions. Considering the disease as a local disorder producing general symptoms, as do all other serious local affections, there is no difficulty in accounting for the facts mentioned.

CAUSES OF DIPHTHERIA.

It is important to know the causes of this disease, for several reasons :—

1. That if possible they may be avoided.
2. To secure a better chance for recovery, in cases of the disease, by removal of the causes so far as possible.
3. To aid in the selection of the proper remedies for the disease.

A knowledge of causes is important in all classes of disease, in order to aid in their intelligent management; but such knowledge is especially important in this disease, for the reasons named, since it is one which can only be controlled by attention to causes. Medical treatment applied without knowledge of this sort is wholly empirical and experimental. No positive and constant results can be expected. Every attempt at treatment is only a blind experiment on the vitality of the patient. This kind of blind, unphilosophical management, or more often mismanagement of the disease, has undoubtedly served to greatly increase its percentage of mortality. It is important that the disease should be well understood, everywhere, as by attention to it from the very outset of the malady, and the consideration of its causes and of its infectious character in its treatment, a large share of the mortality arising from it may be saved; hence it will be profitable for us to bestow sufficient space upon this part of the subject to secure its thorough mastery by any one who is willing to take the pains to inform himself on the subject.

The causes of this disease, like those of most other maladies, may be separated into two classes, as follows: 1. Exciting causes; 2. Predisposing causes.

1. Under the head of exciting causes, the following facts are worthy of careful attention:—

Diphtheria Germs.—The minute organisms already described as peculiar to this disease act as the

immediate exciting cause in all cases. These germs find ready access to the throat and nasal cavity, the parts most readily affected by the disease, being taken in by the act of respiration. The particular germs which are characteristic of this disease are more or less common in the air, especially in proximity to decomposing matter. It is their enormous numbers and extraordinary activity which give to diphtheria its dangerous character.

Diphtheria Contagious.—Since the disease is caused by germs, and since these very germs are produced in great abundance in the body, and thrown off with the breath and other excretions from the body, it is evident that it may be communicated from one person to another. Clinical experience has verified this fact innumerable times. Experiments upon animals have also shown that the disease is communicable by inoculation. The affection is very appropriately called by one author a “miasmatic, contagious disease.” On no other hypothesis can observed facts be reconciled. The disease is now generally recognized as contagious, and is treated as such by all enlightened physicians. The certain knowledge of this fact is sufficiently useful to well repay all the labor and time which have been devoted to the investigation of this malady.

Origin of the Germs.—Diphtheria may very appropriately be included in the class of diseases latterly known as filth diseases, since the parasitic organisms essential to its production belong to a class of organ-

isms which flourish in organic filth. There can be no doubt that in decomposing, putrefying, organic matter the germs of this disease find their origin. One great source of such poisonous matters may load the air of a whole village with the poisonous germs, and thus expose to its ravages a whole community at once.

Neglected cess-pools, foul vaults, leaky sewers, damp, unventilated cellars, moldy walls, all these and every other source of organic decay are the favorite haunts of these destructive organisms; and the only wonder is that cases of profound poisoning by these parasitic pests are not more common than they are. It is a mystery that so many escape.

Spontaneous Origin of the Disease.—What are termed spontaneous cases of the disease, that is, those which originated without previous exposure to contagion from a person suffering from this affection, are not uncommon. These cases undoubtedly originate from the production of germs by the usual sources of disease germs which have already been indicated with sufficient definiteness.

Affinity between Diphtheria and Typhoid and other Fevers.—There is some evidence to indicate that the cause of typhoid fever and diphtheria may not be so very different. It is often observed that diphtheria is particularly abundant when typhoid fever is especially prevalent. We once observed an epidemic of typhoid fever which was followed by a number of cases of erysipelas, which was, in turn,

succeeded by an extensive epidemic of diphtheria. Whether the germ elements which at least play an active part in the development of these diseases are precisely the same or not, we may not be able to decide with certainty; but we may at least be certain that the germ causes of these two formidable diseases have a common origin in filth.

Extraordinary Tenacity of Life.—It is an observed fact that germs of all sorts, as well as all very small organisms, are remarkably tenacious of life. It is almost impossible to destroy them either by boiling or by freezing, as they will endure both extremes for hours without losing their vitality. The germs will even retain their virulent properties for months. A house in which a family had suffered with diphtheria was vacated for several months, and on being again occupied, communicated the disease to its new inmates.

Water, a Medium of Contagion.—Drinking water, milk, and even beer, have been proven to be the vehicles of typhoid poison in many instances. There is good reason to believe that diphtheria may be communicated in this manner also, the liquids named being contaminated by absorption of the emanations from prolific sources of germ poisons, or by direct contamination with the excretions of a diphtheritic patient.

Dangerous Kissing.—The common custom, most prevalent among the gentler sex, of rather indiscriminate kissing, bestowing especially frequent favors of

this sort upon small children, cannot but be deprecated. There are on record numerous instances of the communication of most loathsome diseases through the seemingly harmless medium of a kiss; and there is a special danger respecting this disease which is well worthy of consideration. When an epidemic of diphtheria is prevalent, there are numerous cases, especially among adults, which are so very trivial in their general symptoms that the individual considers the difficulty nothing more than a cold, when he is really suffering with diphtheria, having distinct patches in his throat, and is, unconsciously, sowing broadcast the seeds of disease wherever he goes. Such a person calls to see a neighbor, and as usual, smothers the baby with kisses, and, perhaps, also kisses the larger children. What is the result? Very likely a week has not passed before the little one has diphtheria in a very severe form, and, possibly, dies. Thus an act intended as one of affection, becomes, literally, the embrace of death. This hint is worth thinking of. Life is too valuable to be sacrificed for a kiss.

Other Means of Contagion.—A few other means of contagion which we do not remember having seen mentioned are perhaps worthy of attention in a practical treatise like this. The disease may unquestionably be spread very rapidly by the use of a common drinking-cup at school or elsewhere. One of the worst cases of diphtheria we ever saw was in a little child who had taken the disease from a workman employed on the premises, by sipping water from the

man's drinking-cup. The man suffered but slightly; but the little boy narrowly escaped without serious injury after a very severe illness, with extensive production of the false membrane. Toys and even books may also become the medium for communicating the disease, as well as articles of clothing, and anything that may become infected by the breath or expectorations of the patient.

2. Predisposing Causes.—Anything which impairs the vital functions will predispose to an attack of any febrile or other disease. We do not purpose to mention here all the numerous causes of impaired vitality, but only some of those especially active in rendering the system liable to the disease under consideration.

Taking Cold.—"Taking cold" is a process very difficult to describe exactly, but is so common an occurrence that the phrase is significant to every one. In general, when a person has taken a cold there is more or less congestion and irritation, if not actual inflammation, of the mucous membrane of the pharynx, and often of the nasal cavity also. There is also usually present an increased secretion of these parts, and a tumid condition of the mucous membrane. This condition is particularly favorable not only to the lodgment and development of the diphtheria germs, but to the development of the accompanying inflammation.

Chronic Catarrh.—Chronic inflammation or catarrh of the pharynx, as well as nasal catarrh, is also

a powerful predisposing cause of diphtheritic inflammation of those parts. When the mucous membrane is already affected by an inflammatory process, the presence of the diphtheria organisms is all that is required to convert the morbid process into a diphtheritic inflammation. Consequently, those who are thus suffering should be exceedingly careful to avoid any sort of exposure to infection from the disease. Persons who have been subject to catarrh usually find the difficulty greatly increased after an attack of diphtheria.

Insanitary Conditions.—Insanitary conditions, by impairing the vital forces, and thus diminishing the vital resistance of the tissues, will produce a strong predisposition to diphtheria. As already shown, all sources of decay may also be sources of diphtheria poisoning, so that insanitary conditions are both directly and indirectly productive of this dangerous malady. This fact is well worthy of repeated emphasis.

Age.—Children under ten years of age show a marked susceptibility to this disease. Between the ages of two and four years the susceptibility is greatest. Children under one year of age are not likely to have the disease. Very young children seem to be almost wholly protected against it by their infancy. Children are not only the most liable to take the disease, but they are likely to suffer the most severely. Adults, except in cases of extreme old age, suffer much less from the most serious results of the disease on account of greater size of the larynx. In children the larynx is so small that suffocation is imminent

when the throat becomes affected, while adults may suffer the same amount of infection and invasion of the throat and larynx without any serious interruption of respiration. This is one cause for the greater fatality of the disease in children.

Weather Not a Special Cause.—The observations thus far made upon the disease tend to show that, contrary to the commonly received opinion, the prevalence of the disease is little affected by the season of the year, or by atmospheric or other meteorological changes. The disease is often more prevalent in the cooler seasons of the year than in the summer, but probably this fact is wholly due to the increase of predisposing influences of other sorts at those times, as increased frequency of colds and nasal and pharyngeal catarrhs; less free circulation of air in dwelling-houses greatly increasing the virulence of the poison wherever it may chance to be at work, and similar incidental causes. The disease has been known, in many instances, to extend its ravages in certain localities as widely and as fatally during the heat of summer as at any other season of the year.

There is no evidence that ozone or any other natural constituent of the atmosphere is either an exciting or predisposing cause of this disease, as has been supposed by some.

HOW TO PREVENT DIPHTHERIA.

WE have now come to the practical part of this subject, to which all the foregoing statements of facts and theories have been introductory and preparatory. The prophylaxis or prevention of a disease so serious in its character, in its results, so fatal in its tendencies, so tenacious in its hold upon its victims, and so prone to seize upon the frailest and most helpless members of the household, is a matter of paramount importance in the consideration of this subject. It has been well said with reference to disease in general that "prevention is better than cure." There can be no question of the truth of this medical maxim with reference to this disease at least. Its fatality is so great, its infecting poison is so virulent in its character and so tenacious of life, and the results of the disease are so serious and often so permanent, even in the mildest cases, that it is of the greatest importance that active, energetic, and effective measures should be adopted for its limitation and prevention, if medical science or experience affords any information respecting the proper methods for securing so desirable results.

The prophylactic measures to be adopted are not numerous nor difficult of application; on the contrary, they are few and simple, and if thoroughly employed, are remarkably effective.

Avoidances of Causes.—Evidently the first indication for prevention would be entire avoidance of all the exciting and predisposing causes of the disease. Avoidance of the exciting causes will of course secure entire immunity from the disease. Avoidance of the predisposing causes will greatly increase the chances for escape, even when the person is necessarily exposed to the specific poison which is the most active agent in its production. The recapitulation of all the facts mentioned under these two heads is unnecessary, as the reader can readily refer to the previous sections to refresh his memory if necessary.

Avoid Taking Cold.—This predisposing cause is so active an agent in augmenting the prevalence of diphtheria by greatly increasing the susceptibility to infection that it is worthy of separate mention, although already covered by the remarks in the preceding paragraph. As before explained, catarrh of the pharynx and of the nasal cavity renders the mucous membrane of those parts much more susceptible to the malign influence of the parasitic organisms which constitute the contagium of this disease. The mucous membrane is rendered in some degree defenseless against the poison of the disease, and its congested state renders it a most fertile soil for the development and dissemination through the system of the minute organisms which are the agents of mischief in this disease. If diphtheria is prevalent in a neighborhood, parents should exercise the greatest care to keep their children from taking cold. This

will not be successfully accomplished by keeping them confined in close rooms, but by keeping the skin active by frequent bathing, and the circulation vigorous and well balanced by proper clothing, warm undergarments, thick shoes and stockings, etc. It is of especial importance that the limbs should be thoroughly clad with warm woolen garments, and that the feet should be kept dry and warm. It is not necessary that shoes or boots should admit water to cause coldness and dampness of the feet. If they are simply wet on the outside, the feet will be chilled by the evaporation, and will often become damp by perspiration, and the person is very liable to contract a cold. Mothers should exercise especial care for their children's feet if they wish them to avoid taking cold. Overshoes should be worn on cold, damp days, but should be removed as soon as the child enters the house. The feet are greatly injured by the constant wearing of rubber or other impervious covering. What is true of overshoes is equally true of rubbers. They should never be worn in the house.

Ventilation.—A person suffering with diphtheria constantly sends out with his breath volumes of the disease-producing organisms which are preying upon his system. Unless the air in the sick room is constantly renewed, the whole atmosphere soon becomes saturated with contagious matter, and any one coming into the room is placed under the most favorable conditions possible for becoming infected. By thorough and constant ventilation, the germs are car-

ried away as rapidly as they are generated, and thus the danger of contagion is greatly lessened. Thorough ventilation is also a most important measure of treatment, as well as prevention. If the air is charged with germs, the system of the patient will be continually reinfected as he breathes over and over again the poison-laden atmosphere.

If the means of ventilation are not such as to allow of a constant change of air without injury to the patient by the production of strong draughts, the following plan may be adopted: Secure as nearly the right conditions for a constant supply of fresh air as is possible under the circumstances. Then, to completely renovate the air of the sick room, at least once in half an hour, open the doors and windows widely for four or five minutes. As a precaution against any possible injury, the fire may be urged a little more briskly just previous to the airing and for a few minutes after. The patient may be protected from draughts by an extra covering at the same time.

But the most desirable plan of all is to provide the sick room with a good ventilator, which can be done very easily and at small expense. (See advertisement of ventilators at the conclusion of this work.)

Isolation of the Patient.—As soon as it is discovered that a member of a family is affected with diphtheria, the patient should be placed in a room apart from other members of the family, and only those necessarily employed in administering to the wants of the sick one should be allowed to frequent

the room. The younger members of the family, especially, should be entirely excluded from the room. Careful attention to this rule would often prevent the extension of this dangerous malady to other members of the family. Visitors who call should rarely be admitted to the sick room, as they may not only contract the disease themselves, but become the vehicles of the contagium to others. Isolation of patients is not always pleasant, either to patients or to friends; but in case of contagious disease it is a matter of great importance, and a duty to society which cannot be neglected without injury to some one. It is well that our State Boards of Health and other sanitary officials are becoming awakened upon this subject. The State Board of Health of Michigan has published a circular on the restriction and prevention of diphtheria which is so concise, practical, and complete, that we have reproduced the greater portion of it at the conclusion of this work.

Preventive Treatment.—In addition to the several particulars mentioned, we are convinced from repeated observations that some measures of treatment can be adopted which are of great service in protecting an individual against this disease.

In the first place, it is always important that the excretory organs, especially the liver and the skin, should be kept active by frequent bathing and abundant exercise in the open air. But the especially important measure of treatment to be adopted is of a local character, consisting of disinfection of the mouth. As

before observed, it is through the air-passages that infection of the system occurs. The fauces are almost always the first point of attack. There are many well-known agents which will destroy the germs of diphtheria as well as other classes of germs, some of which may be utilized in treatment. All disinfectants are agents of this sort. Permanganate of potash and chlorine are especially useful for this purpose. Both of these substances may be used to great advantage as gargles by those who are exposed to diphtheria. The permanganate dissolves very readily in water, and should be used in a solution sufficiently strong to have a deep purple color. Chlorine may be employed in several ways, as follows: 1. A solution of fresh chloride of lime as strong as can be borne in the mouth; 2. A strong solution of common salt. A saturated solution is required; 3. A solution of chlorinated soda, in the proportion of one part of the solution, as found at the drug stores, to two or three of water, according to the strength of the solution. The preparation last mentioned is by far the best. We use it constantly for this purpose, and, apparently, with excellent success.

Gargles, to be effective, must be employed thoroughly. Their object is, of course, to destroy the germs which accumulate in the throat from the air, before they have time to set up a morbid process in the fauces and get into the blood. If this could be done constantly, so that no germs would escape alive, the protection would be complete. The treatment is

necessarily intermittent. Nevertheless, if a gargle, such as described, is used very thoroughly every half hour, the chances of taking the disease are greatly decreased.

This remedy is so simple it should be thoroughly employed by all who are necessarily exposed to diphtheria even in its mild form. It is true that the virulence of the poison is usually proportionate to the intensity of the disease in the case from which it is derived; yet it not infrequently happens that a very malignant case results from infection by a case which was in all respects very mild in character. Children who cannot use the gargle successfully should have it applied with a swab, or syringe.

DESCRIPTION OF THE DISEASE.

SOME medical authors devote considerable space to descriptions of this disease in all its numerous phases, but we shall only attempt, in the brief space at our command, to sketch the chief features of the malady, such as may be intelligible and serviceable to the common observer, for whom this work is chiefly prepared.

The local disease which is the primary lesion in this affection varies so greatly in intensity and in extent, the general symptoms growing out of the local morbid process being modified accordingly, as well as by the age and other conditions of the patient, that

different cases of the disease in the same family may differ so greatly as to be hardly recognizable as identical in character. In one, the local and general disturbance will be so slight that without examination of the fauces and discovery of the membrane the patient will think himself merely suffering from a "sore throat" due to a cold. Such cases as these usually sow broadcast the seeds of the disease, its nature not being recognized, and no precautions considered necessary. In another, the diseased process may acquire an intensity and malignancy only equaled in the fatality of its effects by the terrible plagues which in past times have swept over and decimated the great centers of civilization in the Old World.

Different Forms of the Disease.—These varying manifestations of different degrees of the same morbid process have acquired various names as independent diseases; but it is quite evident that they are only phases of the same malady, and require, in treatment, the application of the same general principles. In order to be able to recognize the disease, it is important, however, to understand the several phases which it manifests; hence we shall observe the following classification of the disease: 1. *Catarrhal*; 2. *Croupous*; 3. *Malignant*.

Period of Incubation.—The period of incubation of the disease is, according to most authorities, two to eight days. The average is two or three days. In some cases, as many as ten or twelve days have been known to elapse after exposure before the ap-

pearance of the characteristic symptoms of the affection.

An important fact to be recollected is that one attack of diphtheria is no protection against subsequent attacks. Indeed, a person who has had diphtheria is even more susceptible to the poison, and more liable to infection, than if he had not suffered from the disease.

Catarrhal Diphtheria. — This, the mildest, is also the most common form of the disease. It begins without warning, there being no premonitory symptoms. The fever, if there is any present, is very slight. The patient usually complains of a feeling of malaise, dryness in the throat, with a slight pain in the part, which is increased in swallowing. The glands about the throat swell somewhat, and are a little tender on pressure.

Occasionally more marked symptoms appear, the fever being more intense, the temperature, as indicated by the thermometer, rising three or four degrees above that of the body in health. The skin is dry and hot, the face flushed, the pulse frequent and full. There are usually, also, heaviness of the head, stupidity, great thirst, and much pain induced by swallowing. The stomach is also frequently disturbed, nausea and vomiting often occurring. The latter symptoms also occur, in some cases, at the outset of the disease.

In this form of the disease the infection is so slight

that all the symptoms named usually disappear almost altogether in a day or two, often sooner.

Many of these cases pass through their entire course without their real character being suspected. If, however, an early examination of the patient is made, it will be seen at first, upon inspection of the mouth and fauces, that the mucous membrane has an unnatural, vivid red color, and is considerably swollen in certain places, from the intense congestion. Only one tonsil may be affected, or both; or the soft palate, the uvula, the back part of the pharynx, behind the uvula, one part, or all, may be involved in the disease. The affected tonsil usually appears considerably swollen, projecting into the cavity of the throat. After a few hours, small grayish-white or whitish-yellow spots, varying in size from that of a pin head to a very small pea, make their appearance. The spots are usually arranged in a few delicate, ring-like groups. They may be quite distinct, or may run together.

In most cases of this form of the disease the exudation described is confined to one tonsil; no extensive false membranes being formed.

After the first twenty-four hours, the patches which appear begin to assume a dirty gray color. The mucous membrane rapidly becomes normal again, its unnatural redness disappearing, so that after two or three days the patches may be seen clinging to a membrane in other respects perfectly healthy. On the third or fourth day, sometimes as late as the fifth

or sixth, the patches already loosened from the mucous membrane become wholly detached, and the membrane is left in its former condition, there remaining no trace of the late disease.

Croupous Diphtheria.—But the disease does not always terminate so quickly and so favorably. Instead of progressing steadily toward a speedy resolution, the morbid processes continue about the same as on the first day, for several days. On the fourth, or, possibly, as late as the sixth day, the temperature suddenly rises to 103° or 104° F. The pulse also indicates a high fever, ranging from 120 to 130 beats per minute. The head is hot and the mind confused. There is great increase of thirst, and dryness and pain in the throat. The diphtheritic membrane extends very rapidly, the spots running together, forming a large whitish patch equal in size to a silver quarter dollar. Indeed, in a short time a large portion of the mouth and fauces may be covered. This is the *croupous* form of the disease.

Sometimes the croupous form begins with chilly sensations—not a true chill—which are followed by intense fever, the temperature rising as high as 105° , or over. The patient may suffer from nausea and repeated vomiting, and usually complains of pain in the head, neck, and loins, weakness in the limbs, and drowsiness. Children are inclined to sleep during the day time even more than is natural, but are restless at night, having some delirium, with convulsive twitchings of the limbs, and occasionally even an actual

convulsion occurs. All the symptoms described as occurring in the catarrhal form of the disease are intensified in this, and succeed each other with much greater rapidity. When the disease assumes the croupous form from the outset, the local symptoms are much more rapidly developed, and the membrane very quickly becomes very thick and of a leathery consistency. If the false membrane is torn off, it comes away in shreds, and is quickly replaced by another.

The fever usually increases in proportion to the intensity of the local disease. After a few days, it diminishes. At this time, if nature has not begun a reparatory process, the patient is very liable to sink in collapse and die, even in a few hours. At this point the disease often assumes the malignant form. Unless the mouth is kept perfectly cleansed by very frequent rinsing, the breath of the patient at this time becomes exceedingly offensive from the decomposition of the mucus, exudation, false membrane, etc., which rapidly accumulate and become putrescent in the mouth.

At this stage, the kidneys often become affected, which is shown by the appearance of albumen in the urine. This is an indication of the general infection of the whole system, and is a grave symptom, since the condition may continue for months if the patient recovers.

If the local disease does not extend much beyond the fauces, the patient usually recovers rapidly. But in severe cases, this is not the termination. The disease

gradually extends along the mucous membrane to other parts of the air-passages, upward into the nasal cavity, the Eustachian canals, and even to the ear, and downward into the larynx, trachea, and bronchi. The patient may die of the intense poisoning of the whole system. Even gangrenous sloughing may occur, which is almost certain to be followed by a fatal result.

Sometimes a relapse occurs after recovery seems to be well established, but it is not commonly followed by a fatal result. The duration of this form of the disease is usually two or three weeks, being occasionally as brief as ten or twelve days. When recovery is to take place, improvement usually begins as early as the beginning of the second week, when the fever frequently disappears very suddenly, notwithstanding the presence of large patches of membrane. The tongue, which has been densely coated, clears, appetite returns, the patient sleeps well, the kidneys act more freely, and weakness seems to be the principal difficulty remaining. The membranes may disappear in two or three days, or may persist for several weeks.

Diphtheria of the Nose.—The invasion of the nose is indicated by a sensation of dryness and a stuffed feeling which interferes with respiration. A discharge soon appears which is much like the discharge of the acute stage of nasal catarrh, becoming foul and bloody as the disease progresses. Hemorrhage from the nose sometimes occurs. When the disease extends into the Eustachian tubes, the invasion

is indicated by a ringing, buzzing, or roaring sound in the ears. Severe pain is experienced in swallowing, and the hearing is diminished. A false membrane is in these cases formed in the tympanum, covering the ossicles. The final end is in perforation of the drum, and a discharge of pus.

Sometimes the extension of the disease to the nose is indicated by reddening of the skin of the nose, or oedematous swelling, with remarkable pallor and a glistening appearance. A slight extension of the disease to the nose may end in recovery; but if the surface covered is extensive, death is very liable to occur. This form of the disease usually terminates, in some way, in a few days, too often fatally. The decomposing membranes in the nasal cavity cause extensive ulcerations, and even destruction of the cartilages and bones of the nose, and the patient dies of general poisoning from absorption of the decomposing matter into the blood.

Diphtheria of the Larynx.—In bad cases of croupous diphtheria, the membrane extends low down in the pharynx, and then invades the larynx. Sometimes, also, the larynx becomes affected when the patches in the throat are quite small. It is even possible that the membrane may make its first appearance in the larynx. Sometimes the lips are first affected, then the larynx, skipping the throat. But the local affection of the larynx usually occurs by extension of the disease from the throat on the third or

fourth day of the disease, sometimes even late as the latter part of the second week.

In diphtheria of the larynx the special danger arising from the disease in this part is greater the younger the patient, since the smaller the larynx, the more imminent the danger from suffocation. Patients debilitated by age or otherwise, are also likely to suffer fatally.

In adults, there are no special symptoms which immediately indicate the extension of the disease to the larynx, except a general increase of the fever and exaggeration of the symptoms arising from disease in the fauces; but shortly there appears evidence of inflammation and some degree of obstruction in the larynx, in the change of voice, hoarseness, a dry cough, which is without resonance, whistling with the drawing in of the breath, sometimes great obstruction to respiration from the inflammation and swelling of the vocal cords. In adults, when death occurs it is usually from general poisoning; or, it may occur in consequence of the obstruction caused by a separation of the membranes, which occasionally fall down into the larynx instead of being expectorated, and so cause obstruction and suffocation as any other foreign body in the same locality might do.

In Children the symptoms mentioned as occurring in adults are much more marked, and many others are also present. The peculiar characteristics of the disease in this location are whistling respiration, and a very peculiar, flat, barking sound, without resonance,

which is known as "croupy cough," the same symptom being present in true croup. Loss of voice and the other usual symptoms of croup are present. The epiglottis is usually swollen to double the natural size. In bad cases the face presents the cyanotic or bluish appearance characteristic of partial suffocation.

In this form the disease usually runs its course in two to eight days, though it may continue as long as two weeks. It is not impossible for recovery to take place in this disease, but death usually results in consequence of suffocation from spasm of the glottis; obstruction of air-passages by secretion and false membrane; blood poisoning; pneumonia of the lungs; or œdema of the lungs or glottis. Any one of these causes is sufficient to produce a fatal result, but in most cases several or all are combined.

When recovery does occur, it is by the separation and expectoration of the false membrane, which sometimes is coughed up entire, presenting an exact cast of the larynx. Hoarseness continues for some time after recovery in most cases.

Malignant Diphtheria. — As previously mentioned, in bad cases poisoning of the blood may occur from absorption of the products of the decomposition of the false membrane. Sloughing of the tissues of the affected parts is also an occurrence in the worst cases of the croupous form of the disease. The symptoms of extreme prostration and of profound poisoning of the system, as well as the great fatality in these cases, well entitles the disease in this form to

be called malignant. The terrible "black vomit" and the worst form of yellow fever are scarcely more malignant in their symptoms or results.

Blood poisoning sometimes occurs as early as the second day, but more often later. After the membrane appears, the breath gradually becomes foul, from the decomposition of the membrane, which becomes brittle and soft, and very offensive. The glands become greatly swollen, so that the face and neck appear as one. The skin about the throat is smooth and shiny, and the parts hard, and doughy. The pulse becomes weak and slow, sometimes not more than fifty or sixty, even as low as forty. The temperature sinks one or two degrees below the normal temperature. The patient often dies suddenly from collapse, with failure of the heart.

When the blood is once thoroughly poisoned, recovery is extremely rare. If improvement does occur, it is indicated by a cessation of the discharge from the nose, a gradual clearing of the fauces, an increase in the pulse, and a rise in the temperature, indicating a revival of the vital forces. The patient will begin to exhibit symptoms of slight fever again. The sodden appearance of the face disappears, and the swelling diminishes. The recovery is very slow indeed, occupying weeks.

With the occurrence of gangrenous sloughing of the fauces, collapse rapidly comes on. This occurrence is indicated by small pulse, cold skin, with the development of erysipelas on portions of the skin, involuntary

discharges from the bowels, inflammation of internal organs, shortly followed by death. Recovery of cases in which gangrene occurs is extremely rare.

Paralysis and Other After Results.—Secondary affections of various sorts may follow any form of diphtheritic disease. The most common of these is paralysis. Paralysis of the soft palate and pharynx is the most frequent; but the disease may involve any part or the whole of the muscular system. This affection usually comes on after the local disease is cured, even as late as the fifth or sixth week. It usually appears in the second or third week, beginning so insidiously as to be scarcely noticeable, and gradually increasing until fully developed. The soft palate is first affected. The uvula hangs down, making it impossible to give the open sound of the vowel *a*. If the paralysis is of one side only, the uvula will be drawn over toward the healthy side. The patient finds difficulty in articulation, in swallowing, and in expectoration. The speech is thin and nasal. The sounds of syllables run into each other, being sometimes almost unintelligible. The patient will sometimes complain of liquids getting into the nasal cavity in drinking.

Next, the vision may be affected. Patient cannot read fine print as before, and has flashes of light before his eyes, which are easily fatigued. Double vision, squinting, and vertigo, are also common symptoms.

Paralysis of the muscles of the upper and lower

extremities, of the larynx, of the face, the eye, the neck, trunk, and diaphragm, and of other parts also, occur in many instances, beginning a week or two after convalescence begins.

TREATMENT.

THUS far, the treatment of this disease has not been very satisfactory. The history of the various epidemics recorded shows a mortality of one in every two and one-half cases, or forty per cent. In some epidemics a rate of mortality as high as sixty and even seventy-five per cent. has been reached. This makes the disease even more to be dreaded than small-pox or cholera. Even yellow fever scarcely exceeds it in fatality.

Notwithstanding the discouraging outlook for the treatment of this disease, there is reason to hope that the adoption of improved methods of treatment may greatly lessen its present fatality. Constant improvements are being made in the therapeutics of this as well as other diseases; and it is to be hoped that in the near future its terrible ravages will be stayed by a better application of remedies in its management. The plan of treatment which we have to recommend is based on practical experience with a large number of cases. To our personal knowledge it has been employed in more than three hundred cases with uniform success, no death occurring when the treatment was applied soon after the outset of the disease, and per-

severingly employed. We have ourselves observed its efficiency in the treatment of fully one hundred cases, and have never seen a patient lost which was thus treated. Yet it is not claimed that this or any other plan is a specific. We expect sometime to meet with a fatal case, since no method of treatment can be infallible; but we are thoroughly convinced that a great improvement can be made on the ordinary mode of treating this disease.

Indication for Treatment.—In the treatment of any disease that plan will be found the most successful which is based upon a study of nature. Every acute disease must be considered as an effort of nature to make right some wrong condition; to remove some obnoxious element; to restore the system to a normal condition. What the physician should do is to watch the indications of nature, and assist her in her work by supplying proper conditions, by removing causes, both exciting and predisposing, by removing obstacles so far as may be done by artificial means. Thus nature may be aided in her work. Too often the efforts of the physician are such as to thwart the purposes of nature, and to render ineffective the *vis medicatrix naturæ*, which with a proper opportunity might have secured the patient's recovery.

The physician should ever exercise the greatest care that he does nothing to hinder the efforts of nature. Better do nothing than to do the wrong thing. Firing random shots is a most unsafe practice in treating disease. Better by far trust wholly to nature with

the aid of good nursing than to run any risk of placing hindrances in her way. We have no doubt that at least a portion of the fatality of the disease under consideration has been due to injudicious treatment, the employment of improper remedies, and neglect of the proper measures.

The indications to be met by remedies in the treatment of diphtheria may be classified as follows, according as they are either local or general in character :—

1. *Local indications.*

(a) To subdue local inflammation and mitigate its results.

(b) To prevent general poisoning of the system.

2. *General indications.*

(a) To control the general fever.

(b) To sustain the strength of the patient.

LOCAL TREATMENT.

As already observed, diphtheria is primarily a local disease. This being the case, its local treatment becomes a matter of the greatest consequence. Indeed, this portion of the treatment should receive first attention. This fact has been long recognized by one class of physicians, those who have believed the disease to be essentially local in character; and a great variety of remedies have been employed. Prominent among these has been the application of caustics of various sorts to the throat. Nitrate of silver, nitric acid, hydrochloric acid, iodine, caustic potash, pure

carbolic acid, and various other caustics have been thus employed, but none so frequently or so extensively as the first named. Nitrate of silver is still so largely used that it may be well to give it a brief consideration.

The advantages from its use are supposed to be, destruction of the disease germs and of the false membrane, and the conversion of the diphtheritic inflammation into an ordinary inflammatory process. The objections to its use are chiefly the following:—

1. It accomplishes very imperfectly the destruction of the germs, since all cannot be reached, even by repeated applications.

2. It does not control nor greatly modify the diphtheritic inflammation.

3. By the irritation which it occasions, it most frequently increases the inflammation, sometimes enormously, and, there is good reason to believe, fatally.

4. By the destruction of the epithelium, it facilitates the absorption of the germs into the blood, and so increases the general poisoning.

5. It is a severe remedy, and greatly adds to the patient's discomfort.

6. Its use has not lessened the average fatality of the disease.

7. The most experienced and scientific physicians have abandoned its use, and condemned it in strong terms, as the following citations will show.

After dwelling at some length upon the evil results of cauterization, Oertel remarks as follows :—

“There can be no doubt, then, that the unfavorable results which have been obtained on all sides by cauterizations, more or less energetically practiced, must put a stop to this procedure, even if, in its stead, we should be obliged to resort to its opposite, the purely expectant and symptomatic treatment.” *

Another author, eminent both as a teacher and as a practitioner of medicine, says :—

“A large proportion, if not the great majority, of the practitioners of this country have been led to discontinue the cauterizing and irritating topical applications which have been heretofore in vogue.” †

Numerous other equally eminent names might be cited as opposed to the use of caustics in this malady. Among others, Profs. Janeway and Lusk, of Bellvue Hospital Medical College, New York.

Let us now consider in detail the remedies to be applied in meeting the indications for local treatment.

To control the local inflammation and mitigate its results.

In order to accomplish this, several results must be attained, which we will mention in detail, describing also the remedial measures most likely to secure the desired results.

1. The disease must, if possible, be restricted in its

* “Ziemssen’s Cyclopedia of the Practice of Medicine,” vol. i. p. 673.

† “Practice of Medicine,” by Austin Flint.

progress, and confined to the form which it first assumes. As before observed, it is very likely to pass from a mild into a malignant form when allowed to take its natural course. Hence the importance of early and energetic treatment. Let no time be lost.

There are two classes of remedies useful for this purpose. One destroys the germs, the other limits their development. If thoroughly and persistently used, the employment of these agents will be attended with results quite astounding to those who have never before observed their effects. The first class comprises nearly all active

Disinfectants.—All agents which are destructive to germs when used in a form which will not destroy the living tissues, are useful for this purpose; but the best preparations are solutions of chlorine, or of some of its compounds, permanganate of potash, and carbolic acid. Strong alcohol has proven very effective in many cases. These solutions must be used thoroughly and often as gargles. At least twice an hour the throat and mouth must be well rinsed. If the patient is too young to gargle well, or if the posterior part of the pharynx is affected, the disinfecting lotion must be applied with a swab or syringe. A swab can be easily made by tying a small soft sponge or a strip of muslin to the end of a small stick or a lead pencil. In case the nasal cavity is invaded, the solution must be passed through the nose by a syringe. The following directions for the preparation of solutions which we have found to give exceedingly satis-

factory results may be useful to the unprofessional reader :—

Chlorine Solutions. (a) One part of a freshly prepared solution of chlorine gas, or chlorinated soda, in three to five parts of pure water, according to the strength of the solution and the sensibility of the affected parts. Keep tightly corked, and wrap the bottle with a dark cloth or paper.

(b) In a pint bottle place a teaspoonful of chlorate of potash. Drop in a half-teaspoonful of muriatic acid, cork the bottle quickly, and shake it gently in such a way as to bring the acid well in contact with the crystals. A greenish-yellow gas will appear in the bottle. After allowing the bottle to remain closed for ten or fifteen minutes, remove the stopper and pour in quickly half a teacupful of water. Stopper the bottle again immediately and shake four or five minutes. Repeat the process until the bottle is two-thirds full. Use as strong as patient can bear without causing irritation of the mucous membrane.

(c) Dissolve in a half pint of equal quantities of vinegar and water two heaping teaspoonfuls of common salt. Use very freely.

Permanganate of Potash, one of the most useful of all disinfectants, is a good remedy in this disease. Dissolve in a pint of pure water, in a glass vessel, one-half dram of permanganate of potash or soda. Use of full strength or with an equal quantity of water.

This solution will stain clothing upon which it happens to fall, as well as the skin. The stains are easily removed, however, by a weak solution of oxalic acid.

Carbolic Acid. In a solution of one part of glycerine to three of water, dissolve pure carbolic acid in proportion of three to five drops to the ounce. We sometimes employ equal quantities of water and wine instead of the glycerine solution. To some patients the odor of carbolic acid is very disagreeable. For such, a solution containing an equal quantity of the oil of thyme may be tried.

If these solutions are carefully prepared and faithfully used from the outset of the disease, the results will be exceedingly satisfactory. They can be obtained of any druggist, and most of them can be readily prepared at home if the materials are at hand. It is important that every family should have the materials for at least one or two of the preparations constantly on hand in readiness for use without delay when occasion may require.

There is no known means by which the growth and development of germs may be more efficiently checked than by the use of

Cold.—Cold applications should be made to the throat externally, and the patient should be allowed to hold small bits of ice in the mouth and to swallow them occasionally. The cold applications must be made thoroughly enough to reduce the temperature of the throat as near the freezing point as the patient can endure without suffering, as otherwise it will do al-

most nothing toward modifying the morbid process. The best mode of accomplishing this is to apply to the throat compresses composed of several folds of linen or cotton—flannel may be used when necessary—between the folds of which are placed numerous small bits of ice, or small quantities of snow. The intensity of the cold may be regulated by the quantity of ice or snow used. When the patient cannot bear so great a degree of cold, compresses may be applied wrung out of cold or iced water. The compress must be large enough to cover the throat and extend well around the sides of the neck.

To guard against too prolonged lowering of the temperature and circulation of the part affected, once an hour or two the cold compress should be removed and the throat fomented for ten to twenty minutes.

Some authors condemn the use of cold upon the supposition that it is employed to destroy the germs. This is not the case. The object hoped to be gained, and which is really accomplished, is the retardation of the growth and development of the disease-producing organisms which are present in the parts affected.

2. The next result to be attained is the subduing of the local inflammation. Very happily, the very same remedy which restrains the development of the parasitic organisms, also the most satisfactorily meets this indication for treatment. Cold is well established as the best antagonist of local inflammation, as well as general febrile action.

No remedy could be more appropriate. The directions already given for its application need no further

addition, except it be the caution that care should be exercised that the clothing of the patient and the bed-clothing do not become wetted by the melting of the ice or snow and dripping from the compress, as unpleasant chilliness may be thereby induced.

3. Relief of the suffering of the patient arising from the irritation of the throat and the swelling of the adjacent glands is another important indication to be met. This is usually accomplished in large degree by the cold applications, which although sometimes unpleasant to the patient, from their soothing effects become very grateful to him. Another very important measure is the administration, at intervals of one to two or three hours, of hot fomentations, applied by means of flannels wrung out of water as hot as can be borne by the patient. The fomentations should be renewed every four or five minutes until three or four applications have been made. Hot poultices of linseed meal, bread and milk, or other pasty substances may be applied for an equal length of time. Mustard plasters, if used at all, should be applied very carefully, and for only a very few minutes. Blisters are never advisable, as they will leave a raw surface which will be a fertile field for the growth of a false membrane, and thus become a new source of infection of the blood. Hot fomentations thoroughly applied, secure all the good results of blisters with none of their ill effects.

4. To alleviate the suffering due to difficulty in breathing and swallowing, and to facilitate the remo-

val of the false membrane, also requires the application of proper remedies. The hot applications already described greatly aid in securing these results; but there is no single remedy so efficient as the inhalation of hot vapor. It is not necessary that the vapor should be medicated, although such volatile disinfectants as chlorine and carbolic acid may be added in very small proportions with benefit. The important thing is that the vapor should be as hot as can be borne by the patient without discomfort. A temperature of 110° to 120° will be borne without difficulty by most patients. This remedy soon affords the patient so much relief that even little children manifest a very great appreciation of it. The inhalation should be practiced once or twice an hour at first, and ten to fifteen minutes at a time. The warm vapor acts like a poultice in relieving the swelling, soreness, and spasm, and in facilitating the separation of the false membrane. In cases of croupous diphtheria, especially when the larynx is involved, this remedy is almost the sole reliance for saving the patient's life.

Different modes of applying this remedy have been suggested. It is of the greatest importance that it be done thoroughly. A very good plan is to attach a rubber tube to the nose of the tea-kettle. A tin tube can be readily made by a tinner if rubber cannot be obtained. As the steam is generating, let the patient hold one end of the tube in his mouth and inhale the warm vapor as freely as he can.

Another very good plan is this: Place in an

ordinary tea-pot a few good sized pieces of freshly burned lime. Pour on the lime a boiling hot mixture of vinegar and water. Close down the cover, and let the patient breathe the vapor through the nose. The lime and solution can be renewed as the quantity of vapor diminishes. This is a very good plan if well carried out. The best of all arrangements for this object is an apparatus constructed for the purpose, in which the steam is generated by an alcohol lamp or a gas flame. Every family ought to have an apparatus of this sort to use, not only in diphtheria, but in croup, for which it is the best remedy, for ordinary colds and sore throats, for catarrh, and for local or general vapor baths, to which it is admirably suited.

No attempts should ever be made at the forcible removal of the membrane. If it is torn off, the mucous membrane is left sore and often raw, or bare. When removed thus, another membrane is sure to form. If allowed to remain until removed by the efforts of nature, a sound and healthy membrane is left when it comes away.

The removal of the membranes may be effected by the inhalation of solutions of substances which have the power to dissolve them chemically. A moderately strong solution of lime-water, or of vinegar, answers well for the purpose. An atomizing apparatus is required, which may be attached to the vapor apparatus already referred to. In cases of diphtheria of the larynx, this is a very important measure indeed, and must be used very thoroughly.

The administration of a light emetic is often advantageous in effecting the dislodgment and expectoration of the membranes. A copious draught of lukewarm water is usually sufficient for the purpose; but if emesis does not follow its repeated use, a small dose of ipecac or of some other simple emetic, followed by warm-water drinking, will be sure to induce vomiting.

When the nasal cavity is obstructed by false membranes, thorough syringing should be resorted to, the solution consisting either of equal parts of good vinegar and warm water, or a solution of lime, five grains of freshly burned lime to the ounce of water. The syringing should be continued fifteen or twenty minutes at a time, and renewed at brief intervals until the membrane is softened and comes away in pieces. The face of the patient can be protected during the syringing so that the skin will be in no way unpleasantly affected. Usually very great relief may be given the patient by this measure.

To prevent general infection of the system by absorption of the diphtheria organisms into the blood.

All of the remedies already mentioned aid in answering this indication by limiting the local inflammation and checking the development of the organisms. Whatever renders them less active will deter their penetration of the mucous membrane; and whatever lessens the inflammation of the membrane, renders it better able to resist the attacking parasites and repel their encroachments. Disinfection of the mouth and throat, and the application of cold, are as

efficient remedies to hinder general infection as can be employed.

Ventilation, the common name for air disinfection, is of the greatest importance, next to disinfection of the mouth and throat. This point has already been dwelt upon at sufficient length under the head of "Prevention."

Deodorants, such as ozone, and other non-offensive agents, may be employed to great advantage with appropriate apparatus, for the purpose of purifying the air of the sick-room. Chloride of lime, carbolic acid, and sulphurous acid are too offensive and annoying to the patient to be used in this way with benefit. Probably no agent is so useful for this purpose as ozone, one of the most powerful disinfectants known. A solution of permanganate of potash thrown into the air by an atomizer is a very good deodorant.

GENERAL TREATMENT.

ALTHOUGH efficient local treatment is of primary importance in this disease, general measures are of almost equal value in controlling the symptoms of this serious and so often fatal disease. While those who have regarded the disease as essentially of a general character have failed by disregarding the local manifestations, those who consider it primarily local in character have too often failed by neglecting to give due attention to the general manifestations of the malady. Both classes of symptoms and effects must receive due attention.

The two indications for general treatment of greatest moment are, 1. To subdue the general fever; 2. To sustain the patient until the invading organisms can be repelled.

1. For subduing the fever no remedy equals water in antiphlogistic effects. In general, the febrile action accompanying diphtheria does not rise so high as in most other febrile diseases; yet this symptom is one of no small importance. Unless the patient is sinking in collapse, the fever usually rises in proportion to the severity of the local affection. On the other hand, it will be found by those who will give this point particular attention that the local affection will become less intense in its activity when the fever is controlled by treatment. As before remarked, no remedy excels water for this purpose. It may be applied in several ways with equally good effects. Both the graduated full bath and the wet-sheet pack may be employed with advantage when the fever is high; but tepid sponging, with the application of large compresses applied about the trunk, after being wrung out of cool or tepid water, are generally sufficient to control the temperature in this disease, and are much more easily administered, also giving the patient much less inconvenience than the more heroic measures. They have also the advantage that they are less likely to be abused so as to harm the patient. These measures should be employed with greater or lesser frequency according to the height of the fever. If the temperature is not over 100° , the pulse at ninety, skin only

moderately warm, dryness of mouth and skin, and thirst not very marked, face not deeply flushed, a tepid sponge bath two or three times a day will be all that is required in addition to the local treatment. If the temperature rises to 103° , more vigorous measures must be used. A sponge bath should be given once in an hour or two, and a linen compress of three or four thicknesses, large enough to cover the front and sides of the trunk, must be applied after being wrung out of tepid or cool water. The compress should be changed every twenty minutes; and the cooler it can be applied without discomfort to the patient, the better. When the fever rises still higher, with usual symptoms of great thirst, dryness of lips and skin, hot and flushed face and skin, full, rapid pulse, apply sponge bath every half hour and change compress once in ten or fifteen minutes until the fever abates.

Care must be taken continually in the use of water in this disease, that the patient has no tendency toward collapse. If the pulse begins to flag, is slow and feeble, while the skin is cool, no cooling applications are necessary. Warm applications are needed.

Care should be exercised continually that the limbs are kept warm. Cool compresses may be applied to the head, even the ice-cap when necessary.

At the outset of the disease, when the patient often complains of chilly sensations, a warm blanket pack, given by wringing a woollen sheet out of water a little above blood heat and wrapping it snugly about the

patient, will be found a very excellent remedy, not only for the chilliness, but also for the muscular soreness, which is also a frequent symptom of the outset of the disease.

Diarrhea, vomiting, nosebleed, and the other minor symptoms sometimes accompanying this affection, are to be treated in the usual manner.

2. For sustaining the patient, too great reliance is put by many in the large use of iron and frequent feeding. We have never seen sufficient evidence of the utility of these methods to convince us of their efficiency. Others use stimulants in great quantities, which we believe to be productive of more harm than good. What the patient needs is nutrition, not stimulation. If overcrowded with food, and plied with aliment at too frequent intervals, the nutritive apparatus will have no time for the elaboration of food, and no time for rest. It will be always engaged in the preliminary work of digestion. The overworked stomach will be sure to fail up with indigestion, and the patient will really receive a much smaller amount of available nutrition than if food is taken in proper quantities at intervals sufficiently far apart to allow time for digestion.

Give the patient three meals a day at regular hours. Let the diet consist principally of oatmeal or barley gruel, with fruit and milk toast. If there is difficulty in swallowing solid food, let the patient have plenty of milk, with a moderate allowance of beef soup or broth.

In addition to the various measures mentioned, little else is needed but good nursing. Very little medication is required, if any. Many physicians employ only local medication. We usually prescribe teaspoonful doses of a saturated solution of chlorate of potash once in one to three hours, hoping thereby to destroy some of the germs which find their way into the stomach.

If the patient falls into a state of collapse, the pulse being slow and weak, the skin cool, the respirations rapid, with the other usual symptoms of that condition, the temporary use of stimulants may be useful. We have used electricity, both the galvanic and the faradic, in such conditions, with excellent results. Dry heat is also a useful stimulant in such cases. All may be used in conjunction.

Paralysis and the other secondary affections which often follow this disease should be treated on the general principles governing the treatment of those affections from whatever cause. In the case of paralysis, after the disease is fully developed, electricity should be employed. This, with out-of-door exercise and time, will effect a cure in most cases.

Tracheotomy is a surgical operation sometimes performed when the symptoms indicate imminent danger of suffocation; but before it is resorted to, the condition of the patient is already so hopeless that recovery rarely occurs.

APPENDIX.

RULES FOR THE RESTRICTION AND PREVENTION OF DIPHTHERIA.

THE following rules have been prepared by the Michigan State Board of Health for general circulation. We take the liberty to present them here on account of their excellence. Copies can be obtained of the Secretary of the Board, Dr. H. B. Baker, of Lansing, Mich., to whom we are indebted for several copies.

1. Every person known to be sick with this disease should be promptly and effectually isolated from the public;—one or two persons only should take the entire charge of the patient, and they should be restricted in their intercourse with other persons.

2. The room in which one sick with Diphtheria is placed should previously be cleared of all needless clothing, carpets, drapery, and other materials likely to harbor the poison of the disease. This room should constantly receive a liberal supply of fresh air, without currents or drafts directly upon the patient. It will be well also to have the sun shine directly into the room.

3. The discharges from the throat, nose, and mouth, are extremely liable to communicate the disease, and should be received on soft rags or pieces of cloth which should immediately be burned.

4. The discharges from the kidneys and bowels are also dangerous, and should be passed on old cloths and burned, or into vessels kept thoroughly disinfected by nitrate of lead, chloride of zinc, or sulphate of iron (copperas), and then be *buried* at least 100 feet distant from any well.

Copperas, dissolved in as little hot water as will dissolve it, is a good disinfectant for this purpose.

5. Nurses and attendants should be required to keep themselves and their patient as clean as possible;—their own hands should frequently be washed and disinfected by chlorinated soda.

6. Soiled bed and body linen should at once be placed in boiling water or in water containing chlorinated soda, chlorinated lime, or solution of chloride of zinc.

7. All persons recovering from Diphtheria should be considered dangerous, and therefore no such person should be permitted to associate with others or to attend school, church, or any public assembly, until in the judgment of a careful and intelligent physician he can do so without endangering others.

8. The body of a person who has died of Diphtheria, should as early as practicable be placed in the coffin, with disinfectants; and the coffin should then be tightly closed. Afterward, the body should not be exposed to view except through glass.

9. No public funeral should be held at a house in which there is a case of Diphtheria, nor in which a death from Diphtheria has recently occurred. No children at least, and it would be better in most cases that few adults, should attend such a funeral.

10. The room in which there has been a case of Diphtheria, whether fatal or not, should, with all its contents, be thoroughly disinfected by exposure for several hours to strong fumes of chlorine gas, or of burning sulphur, and then, if possible, it should for several days be exposed to currents of fresh air.

To disinfect an ordinary room with chlorine gas: Having tightly closed all the openings of the room, place in it an open earthen dish containing four ounces of peroxide of manganese. Pour on this one pound of strong muriatic acid, being careful not to breathe the fumes. When certain that continuous evolution of chlorine is taking place, leave the room and close the door.

To generate sulphurous acid gas, put live coals on top of ashes in a metallic pan, and place on the coals sulphur in powder or fragments.

A convenient way is to place the coals and sulphur on a heated stove plate or cover turned bottom upward in a pan half filled with ashes. To disinfect 100 cubic feet of air requires the thorough burning of about one and one-half ounces of sulphur.

11. After a death or recovery from Diphtheria, the clothing, bedding, carpets, mats, and other cloths which have been exposed to the contagium of the disease, should either be burned, exposed to superheated steam, to a degree of dry heat equal to 240° F., or be thoroughly boiled.

The foregoing methods of disinfection are applicable in all contagious diseases.

12. Avoid the special contagium of the disease.

13. Beware of crowded assemblies in ill-ventilated rooms.

All influences which depress the vital powers, and vitiate the fluids of the body, tend to promote the development and spread of this disease. Among these influences, perhaps the most common and powerful are, *impure air and impure water*. Because of this,

and as a means of lessening the danger of contracting almost all other diseases, the following precautions should always be taken, but more particularly during the prevalence of any such disease as this.

14. The grounds under and around the house should be well drained.

15. No vegetable or animal matter should be allowed to decompose on the surface of the ground near the house.

16. If any soap-factory, slaughter-house, rendering establishment, or other source of foul odors, contaminate the air which you and your children daily breathe, take immediate measures through your local board of health or health officer to have such nuisance abated.

17. Your own privy, especially, should at all times be thoroughly disinfected, by dry earth, coal ashes, or copperas water; and the receptacle should be so constructed as to be water-tight and to be tightly covered when removed to be emptied, as it should be often enough to prevent the air about it from becoming offensive, and in cold weather so far as possible.

18. Your whole house, and especially its sleeping-rooms, should be well ventilated.

19. Your cellar should be dry and well ventilated; it should frequently be whitewashed, and always kept clear of decomposing vegetable or other substances.

20. No cess-pool should be allowed near the house. If there be one, it should either be removed or be thoroughly and frequently disinfected with sulphate of iron (copperas).

21. Your house drains should be looked to with scrupulous care, to see that they are well trapped, kept clear, and ventilated into the open air.

22. Your house should not have uninterrupted connection with a sewer. Be sure that the waste-pipes do not permit the entrance of sewer gas into the house, but that they enter the sewer through an open-air space, or at least through a space freely ventilated to the open air.

23. Be sure that your drinking-water is not contaminated by surface drainage, nor by leakage from the drain, gas-pipes, sewer, cess-pool, or vault.

RULES FOR NURSING.

ON account of the great importance of nursing in this disease, we have appended the following suggestions, which are condensed from the "Household Manual of Hygiene," etc., published at this office:—

1. Secure a constant supply of pure air from out-of-doors.
2. Admit the light and sunshine freely. Direct sunlight is sometimes unpleasant to the patient; then shade the windows with white curtains, which will admit the light.
3. Maintain equable temperature. More fire is usually needed in the morning and evening than at noon. Regulate the heat by a thermometer hung near the bed. The mercury should never be above 70°.
4. The patient himself should be kept scrupulously clean. The whole body should be washed several times a week, at least. The mouth and teeth should be daily cleansed.
5. All discharges should be kept in covered vessels, and should be removed from the room at the earliest moment possible.
6. The sick chamber should be made pleasant by tasteful arrangement of its contents, by flowers, simple pictures, etc. Frequent change in the aspect of the room is desirable.
7. The patient should never be kept in a state of expectancy. When a promise is made him, fulfill it promptly.
8. Whispering or low talking in the sick-room or adjoining rooms will arouse the patient's fears unnecessarily. Avoid it.
9. Arrangements for the night should be made before the patient becomes sleepy, so that he may not be disturbed.
10. All avoidable noises should be prevented.
11. The covering of the patient in bed should be several light, porous blankets, rather than one or two heavy ones.
12. Strangers and visitors should be prohibited from entering the sick-room of a feeble patient. Visiting will often determine a fatal issue of the disease.
13. Water kept in a sick-room should be often changed. Never drink that which has been in the room more than a few minutes.
14. Never annoy the patient by questions or too much conversation.
15. Always recollect that Nature must cure. All you can do is to make the conditions as favorable as possible.

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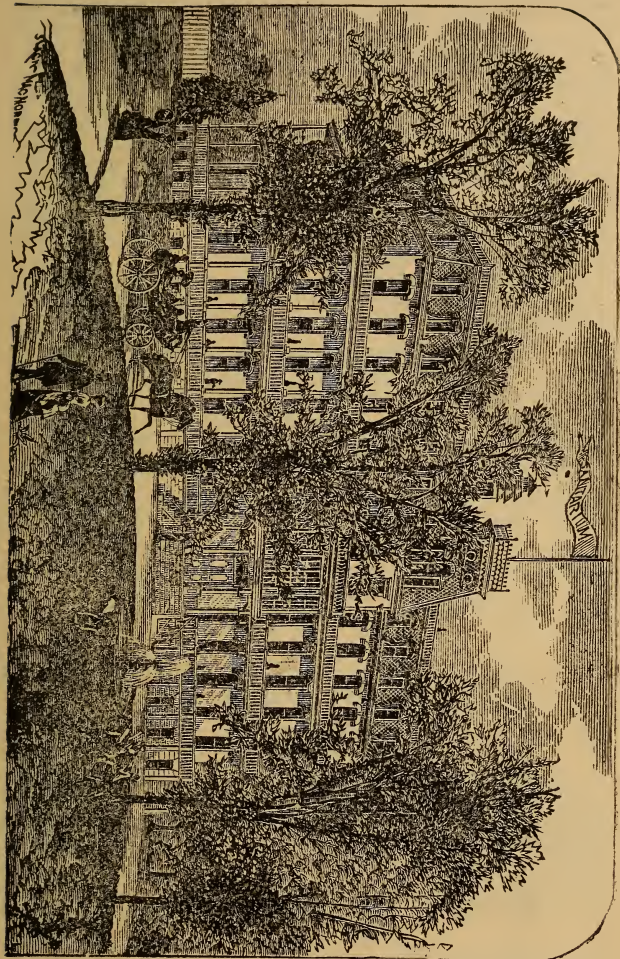
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SANITARIUM,

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Scientific physicians long since decided that the greatest cause of that dread disease, *pulmonary tuberculosis*, is the breathing of impure air. The Eureka Ventilator secures

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UNIVERSAL PLIABLE BATH,

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To Detect Alum in Bread.
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These are all sources of danger to life to which every one is exposed at all times. A small investment will enable one to protect himself, his family, and his friends. Send stamp for circular, to

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One of the most effective of all known means of treatment for *Colds*, for *Rheumatism*, for *Neuralgia*, for *Dropsy*, *Obesity*, and not a few other diseased conditions of a serious nature, is the vapor bath. But the ordinary means at hand for giving a vapor bath at home are so rude that the best results cannot be obtained, if any good can be done.

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It has been demonstrated again and again that in bad cases of croup and diphtheria, especially the latter,

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The only drawback to its efficient use is the want of suitable appliances. To meet this want we offer an apparatus which is simple and effective, and by thorough use

MAY SAVE THE PATIENT'S LIFE,

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It ought to be in every family, in readiness for use if needed. Full directions for use are sent.

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The neatest and most useful thing of the kind ever invented. Every traveler ought to have one. Only \$1.50.

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CARBON FILTERS.

Next to impure air, impure water is

THE GREATEST CAUSE OF DISEASE.

Typhoid and typhus fevers, with many other febrile diseases, originate in impurities in water. We have long been looking for

A PERFECT FILTER,

and are pleased to be able at last to present it to our patrons. From observations made during the last two or three years we are obliged to pronounce

THE KEDZIE FILTER A FAILURE,

for the following reasons, which the experience of many will at once corroborate:

1. *They are only good when new, and are then often defective.*
2. *They require very frequent renewal.*
3. *They sometimes become offensive and a source of contamination of water rather than a means of purification, after a few weeks' use.*
4. *They not infrequently become breeding places for germs.*
5. *Lead is employed in their manufacture, which is itself a source of contamination.*
6. *They require a great amount of attention.*
7. *They are so large and cumbersome to handle that they cannot be easily moved.*

None of these objections apply to the

IMPORTED CARBON FILTER

which we now offer. These filters are manufactured in London, England, where they have the indorsement of the highest sanitary and chemical authorities. The following are some of the advantages of these filters:—

1. *They are the most perfect purifiers of water ever invented.*
2. *They last a long time without change.*
3. *They never become contaminated by germs.*
4. *They can be renewed at any time at a few cents' expense, should renewal become necessary.*
5. *On account of their rapid and efficient action, they can be made small and portable.*

ALL SIZES AND STYLES FURNISHED,

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